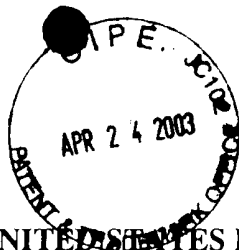


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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: : Wilbur G. Catabay and Wei-Jen Hsia
Appl. No. : 09/884,736
Filed: : June 19, 2001
Title : PLASMA TREATMENT OF LOW DIELECTRIC CONSTANT
DIELECTRIC MATERIAL TO FORM STRUCTURES USEFUL IN
FORMATION OF METAL INTERCONNECTS AND/OR FILLED VIAS
FOR INTEGRATED CIRCUIT STRUCTURE
Grp./ A.U. : 2829
Examiner : Lisa A. Kilday
Docket No. : 00-654

DECLARATION OF WILBUR G. CATABAY

**Honorable Commissioner for Patents
Washington, D.C. 20231**

I, Wilbur G. Catabay, do declare as follows:

1. Education: That I received the B. S. in Industrial Technology from San Jose State University in June, 1983;

2. Work Experience: That from graduation until November 1984 I was employ at Hewlett Packard first, and then at Fairchild; that from November 1984 until the present, I have been employed at LSI Logic Corporation, first as a reliability engineer, and since October, 2001, as a Director of Process Technology;

5

3. That I am a joint inventor of the invention described and claimed in the cited reference, Zhihai Wang, Wilbur G. Catabay, and Joe W. Zhao U.S. Patent No. 6,028,015; that I am also a joint inventor of the invention described and claimed in the present pending application Wilbur G. Catabay and Wei-Jen Hsia U.S. Patent Application Serial No. 09/884,736; That as a result, I am very familiar
10 with the respective processes described in my patent and in my patent application, and the differences between these two processes;

4. That while all low k hydrocarbon-modified silicon oxide dielectric materials are more sensitive to chemical attack (particularly attack by oxidizing agents) than a silicon oxide dielectric, a surface of
15 such a low k hydro-carbon modified dielectric material which has already been attacked by an oxidizing agent (as in my patent) will react differently to subsequent exposure to a plasma formed by a reducing gas than would a similar low k hydrocarbon-modified dielectric material not so exposed previously (as in the process described and claimed in my patent application). This is apparently because in my patent the hydrogen in the reducing plasma chemically reacts with the already broken
20 bonds in the previously damaged low k hydrocarbon-modified dielectric material to form a non-porous dense (but very thin) coating on the previously damaged surface of the low k dielectric material. Such a layer would not be easily further penetrated by the hydrogen in a reducing plasma to form the desired densified surface layer formed in my patent application which (when applied to an undamaged low k material) results in formation of a densified layer which is thick enough to permit
25 formation of a hard mask or an etch stop layer;

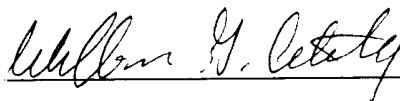
5. That, by way of example, in my present application, it is stated, on page 10 of our application, that the thickness of the densified layer should range from about 300 Å to about 1000 Å, and typically have a thickness of about 500 Å. In contrast, the thickness of the damaged portion of a sidewall of a via (cut through a layer of low k hydrocarbon-modified silicon oxide dielectric material) which will react with the hydrogen in the plasma will be much less, i.e, less than about 100 Å.

6. That I conclude from this that the treatment of an already damaged hydrogen-modified low k dielectric material with a plasma formed from a non-oxidizing gas results in the formation of a layer on the surface of the hydrocarbon-modified low k dielectric material which is different from the densified layer formed by treating an undamaged surface of a hydrocarbon-modified low k dielectric material with the same plasma formed from a non-oxidizing gas.

7. The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made upon information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

9/22/2003

Date



Wilbur G. Catabay